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Integrating Communication into Engineering Curricula: An Interdisciplinary Approach to Facilitating Transfer at New Mexico Institute of Mining and Technology

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Abstract: This program profile describes a new approach towards integrating communication within Mechanical Engineering curricula. The author, who holds a joint appointment between Technical Communication and Mechanical Engineering at New Mexico Institute of Mining and Technology, has been collaborating with Mechanical Engineering colleagues to establish a department-wide program with the goal of facilitating transfer of rhetorical instruction to engineering deliverables involving written and oral communication. To carry out this goal, the program incorporates a set of best practices informed by prior research in the areas of knowledge transfer, writing studies, and educational theory. These best practices and the theories informing them are described in this profile. In addition, the author offers preliminary lessons learned and presents implications for writing faculty interested in facilitating transfer through interdisciplinary initiatives.

> "*Interdisciplinarity…does not simply refer to partnerships that involve more than one discipline; instead, the term refers to a particular kind of intellectual engagement that has a transformative effect on the partners themselves.*" (Paretti 76)

Introduction

Since 2005, I have collaborated with the Mechanical Engineering (MENG) department, which boasts the largest and fastest growing major at New Mexico Institute of Mining and Technology, to achieve the ultimate goal of improving communication skills among their students. Although all students on our campus are required to take our first-year composition sequence and a junior-level technical communication course, the MENG department wanted more customized instruction in their curriculum to help both undergraduate and graduate students achieve better outcomes on written and oral communication deliverables, such as proposals, progress reports, and design reports, as well as oral performances such as speeches, PowerPoint presentations, and poster presentations.

The efforts began as a multidisciplinary partnership involving Technical Communication and MENG, and in keeping with Paretti's description of such a partnership, reinforced "images of writing as a skill and writing instruction as a service" (77). Through guest lectures in MENG courses, I provided technical writing course "refreshers" to junior and senior design students. In meetings with MENG faculty, I offered suggestions for ways to evaluate communication competencies and shared copies of grading rubrics. The information I was providing to students and faculty was helpful and implemented to some extent, but it was still coming from an "outsider," considered the language expert, remaining separate from the "insider" information presented to students by MENG faculty, the content experts.

Paretti distinguishes between content and language experts in her 2011 article “Interdisciplinarity as a Lens for Theorizing Language/Content Partnerships.” As Paretti discusses, an interdisciplinary, rather than a multidisciplinary, framework combining both areas of expertise is ideal for rhetorical instruction. In such a model, “content experts have tacit knowledge about disciplinary communication that supports situated cognition, and language experts have a vocabulary for articulating that knowledge in ways that support metacognition” (“Interdisciplinarity”).

The program profiled here is one that has evolved from an initial multidisciplinary relationship aimed at improving students’ writing and speaking skills into an interdisciplinary partnership focused on not only improving student competencies but additionally on facilitating better transfer of rhetorical instruction between contexts. I begin by providing details about the program and the evolution of the integration of communication instruction within the Mechanical Engineering department, calling attention to how previous research supports our program’s goals and resulting activities. Following a description of the program’s structure and goals, this article includes discussion of the program’s constraints and offers preliminary lessons learned and broader implications for facilitating knowledge transfer through interdisciplinary initiatives.

General Description of Interdisciplinary Program

In this section, I offer a brief overview of the Mechanical Engineering department at New Mexico Institute of Mining and Technology. To establish necessary context, I describe the role communication instruction has played within the curriculum in the past and how that led to the joint appointment position that has been pivotal in shaping our current programmatic goals.

Overview of Mechanical Engineering at New Mexico Institute of Mining and Technology

The Mechanical Engineering department at New Mexico Institute of Mining and Technology boasts the largest undergraduate major on campus with a current enrollment of 313 students (total enrollment of graduate and undergraduate students combined at New Mexico Institute of Mining and Technology is 1850). In addition to offering a Bachelor of Science degree, the department also offers the Master of Science degree, with various tracks accommodating different research specializations. Current enrollment is 47 students. Most graduate students hold Research Assistant positions that include work on high-profile research projects funded through organizations such as the Energetic Materials Research and Testing Center, the Air Force Research Laboratory, and Sandia National Laboratories. Within the Master’s program, students are encouraged and expected to present their research at conferences and through publications. While M.S. students are presented with a thesis or independent study option, the majority of students choose the thesis option.

The following information (from the Mechanical Engineering department’s webpage on undergraduate studies: http://infohost.nmt.edu/~mecheng/undergrad_study.xml [http://infohost.nmt.edu/~mecheng/undergrad_study.xml]) communicates the objectives of the undergraduate degree:

> The Department of Mechanical Engineering at New Mexico Tech will produce Bachelor of Science graduates who are independent thinkers; taking ownership in identifying problems and determining effective solution strategies in a timely manner. Following working experience after graduation they will;
>
> 1. Be employed successfully in government laboratories, graduate schools, industry, or other areas of the profession.

2. Have an understanding of the importance of life-long learning such that they seek personal and professional growth.
3. Have achieved a noteworthy level of workplace responsibility.

Within the 136 hour undergraduate curriculum, students maintain a rigorous schedule of 15-18 hours per semester. First and second year courses include general degree requirements of calculus, chemistry, and physics, as well as introductory engineering courses including statics, fluid mechanics, computer programming, and a materials laboratory. Students also must take three semesters of general education writing courses. English 111: Introductory College English, typically taken during Fall of the freshman year, takes an argument-based approach and requires students to read critically and produce essays that define problems, examine claims and evidence, and organize and evaluate information. English 112: Intermediate College English, typically taken during Spring of the freshman year, involves further instruction in argumentative writing and requires students to include scholarly research within their thesis-driven essays. English 341: Technical Writing requires junior status and teaches students to plan, organize, draft, revise, and edit technical communication that is professional in content and appearance and appropriately designed for its intended audience. (See Appendix 1 [#appendix1] for a complete sequence of courses for MENG majors at New Mexico Institute of Mining and Technology).

Design courses, which students begin in the junior year and are required to be enrolled in for four consecutive semesters, play a prominent role in the undergraduate curriculum. An advanced design clinic is offered as an elective for students desiring additional design experience. Since the design clinic plays such a prominent role in the undergraduate MENG curriculum and has been largely affected by the program I describe in the next section, further details are offered next to establish necessary context.

Junior/Senior Design Clinic

The junior and senior design clinic courses are taught by separate instructors and meet at different times, but they share the same objectives of providing students a thorough overview of design procedures, educating students about design principles and practices to assist them in making informed design decisions and in solving complex problems, and helping students develop a framework for understanding how various mechanical engineering technologies are used in the design process. To attain these objectives, students are organized into project teams and tasked with working on a real-world design project for an external client. Teams consist of both juniors and seniors and are each provided with a faculty sponsor (in additional to their industrial sponsors).

In addition to solving a design problem and creating an actual deliverable as part of that solution, each team in the design clinic must also demonstrate they are adhering to required design principles and processes through several intermediate deliverables. These deliverables include a written proposal and oral presentation of that proposal, a detailed Gantt chart projecting the team’s weekly work and milestones, weekly written status reports, a midterm written progress report and oral presentation of progress, a poster displaying initial results, and a final report and oral presentation of final designs at a design conference held at the end of the semester.

The clinic requires close interaction and coordination between the junior and senior design clinic professors. The syllabi and scheduled assignments for the two courses are in sync, and decisions regarding external design projects and team assignments are made collaboratively. Evaluation of design clinic deliverables is also a collaborative effort.

Results from surveys of both senior students and program alumni attest to the value of the design clinic. In a 2011 survey of seniors, the design clinic was ranked as one of the "best aspects" of the department, while a 2011 alumni survey attributed the "amount of time spent on design" as one of the most valuable components of their engineering degree.

Evolution of Communication Emphasis in the Department

Since 2005 the department has made a dedicated effort to go beyond the general degree requirements of a first-year composition sequence and a junior-level technical writing course to improve students' communication skills. Motivating this effort were two main factors: faculty awareness that their students' writing and speaking skills were inadequate, and information from alumni, employers, and ABET attesting to the necessity for clear and effective communication skills. The department chair sought me out as Director of the Technical Communication program and began a conversation with me to discuss possible ways I could help in this endeavor. Those early discussions led to a number of attempts to better emphasize communication in the MENG curriculum, including offering guest lectures to provide technical writing course "refreshers" to junior and senior design students, scheduling a section of the general education technical writing course with the intent of it filling primarily with MENG students, developing a pilot course in Engineering Communication for MENG graduate students, and my own willingness to extend office hours to MENG students (including those not enrolled in any of my courses) seeking feedback on their writing. Table 1 shows the progression of these steps.

Table 1: Progression of Communication Emphasis in MENG Department

2005	2006	2008	2009	2010	2011
MENG Dept. Chair and TC Program Director discuss ways to improve MENG student communication skills	Technical writing refreshers offered in MENG design clinics	TC Program Director and MENG design clinic faculty view student report examples and discuss deficiencies	MENG students encouraged to take specific sections of English 341: Technical Writing	MENG grad comm. courses piloted	Joint appointment begins. English 341: Tech. Writing for MENG Design first offered

My commitment to helping the MENG department improve their students' skills and their faculty's facilitation of communication instruction was appreciated by the department chair as well as the 10 full-time faculty in the department. Although the information is anecdotal and not empirical, the MENG faculty's perception was that on the whole the writing and speaking skills of students were improving. However, given my teaching and administrative duties in my home department, the strategies described previously, while effective on a short-term basis, were not a sustainable model. I could not offer courses for MENG students on a continual basis, nor could I continue to contribute to the communication instruction in the design clinic with my responsibilities as Technical Communication Program Director and a full teaching load in my home department of Humanities. To solve this problem, the MENG department decided to devote one of their faculty lines towards communication and invite me to move into a joint appointment position. My recognition that such a position would provide valuable opportunities for me to impact MENG curriculum from *within* the department was the largest factor in me accepting the offer. While the term interdisciplinarity was not yet part of my lexicon, I embraced the value of shared intellectual goals and true collaborative approaches towards curriculum design and pedagogy that are offered by such a model.

Joint Appointment Goals

To satisfy the most significant goal of the joint appointment—to impact MENG engineering curricula at New Mexico Institute of Mining and Technology so that communication instruction would be improved and better integrated with students' existing knowledge domains—MENG faculty and I began working in April of 2011 (once the joint appointment was officially approved by administration) and continued through the summer of 2011 (prior to the joint appointment officially beginning in August 2011) to establish the following sub-goals:

- Integrate communication instruction in both undergraduate and graduate MENG courses in ways that made writing and speaking tasks part of each stage of engineering design and research and better encouraged drafting and revision;
- Offer annually a graduate-level course focused on engineering communication;
- Create opportunities to promote metacognition among students to help facilitate transfer of rhetorical strategies;
- Participate in MENG curriculum revision and design.

These goals arose from meetings between me and the MENG department Chair, me and the two design clinic faculty members, as well as communication with the rest of the MENG faculty (I met individually with six of the full-time faculty). While I certainly brought my prior knowledge of the transfer literature and theories of metacognition and situated learning to bear on the ideas proposed, I did not explicitly discuss these theories or prior work in knowledge transfer with the MENG faculty. Instead, I emphasized the value of teaching students writing skills in ways that they could a) carry with them beyond a specific classroom and call upon in later situations and other contexts, as well as b) apply readily to assignments within the MENG design course. I was motivated by Carter's pluralistic theory of expertise, which draws on the work of Perkins and Salomon and combines views of general and local knowledge, framing knowledge transfer in terms of a developmental continuum that suggests that when "people gain greater experience in a particular domain, their performance in that domain relies on knowledge that becomes more and more local, less and less general" (Carter 273). Also key in my conversations with MENG faculty was my intent to create opportunities for students to engage in reflective awareness of the communication process and fundamental rhetorical strategies employed throughout that process. Reflective awareness is defined by Flower as essential to an integrated theory of writing that accounts for both cognition and context. In the following section I provide further details regarding the ways in which this joint appointment has allowed us to begin an interdisciplinary program to accomplish these goals.

Interdisciplinary Strategies towards Integrating Communication

Our approach towards integrating communication instruction (further) in the undergraduate curriculum began with the courses that included the best opportunities for teaching writing and speaking as part of the engineering process, the junior and senior design clinic.

Design Clinic Revision

As noted by Paretti, "Design courses, because they typically engage students in authentic engineering tasks, provide ideal sites to engage students in authentic engineering communication to foster situated learning" (493). During the Summer of 2011, I met repeatedly with the instructors of the junior and senior design clinic courses to revise the curriculum. At our first meeting, I called the faculty's attention towards the discipline-specific communication course for engineering students described in Artemeva et al.'s 1999 *Technical Communication Quarterly* article. Although that course had communication as its central focus, my intent was not to persuade my MENG colleagues to reshape

the entire design clinic course to place communication above the design process in terms of importance; instead, I proposed revisions that would more prominently weave communication *within* the design process. Through practice "that occurs in a variety of somewhat related and expanding contents" the students would be provided the opportunity to apply and adapt rhetorical knowledge, "yielding an incrementally broadening ability" (Salomon and Perkins 120).

Because substantial writing and presentation assignments were already included in the curriculum (as explained in the Junior/Senior Design Clinic description included earlier and as illustrated in the design clinic syllabus example provided in Appendix 2 [#appendix2] and assignments and rubrics included in Appendices 3-8 [#appendix3]), I viewed it as an excellent site for using pedagogical approaches that Artemeva et al. describe as key conditions that need to be met. In particular, these conditions state that assignments are connected to subject matter courses, a dialogic environment is encouraged, and assignments that allow students to "build on learning experiences in the course" can be used to tailor communication instruction to the needs of any discipline (301). Design clinic faculty and I agreed that these three conditions would be suitable ones to strive for in the revision of the design clinic.

Connected Assignments

Beginning in the Fall semester, the report and presentation deliverables required for the design clinic were evaluated by not just the junior and senior design clinic professors, but by me as well. My role as an audience member translated into students having to consider my interpretation and reception of these deliverables in terms beyond those of a mere assignment handed to the course professor. The opportunity to evaluate each report and presentation directly supported the condition advocated by Artemeva et al. of connecting assignments between disciplines, moving us closer to achieving our goal of improving students' communication skills and facilitating transfer of these skills to future documents**.** Further, it supported a strategy advocated in the literature (Paretti; Yalvac et al.) of facilitating an awareness of audience and professional roles beyond one particular course setting by allowing for my interaction with students not specifically enrolled in one of my courses. Fifty percent of their grade for each of these deliverables was evaluation of their communication competence, as opposed to previous years where communication competence was taken into account by design clinic professors when evaluating deliverables but not specifically weighted or guided by a particular rubric devoted to evaluating evidence of specific rhetorical strategies. With audience awareness playing such a prominent factor in evaluation of these deliverables, our hope is that students fully understand the importance of accommodating information towards audiences and carry this crucial rhetorical strategy forward towards future writing and speaking situations.

It is worth noting that even though we made a distinction between technical competence and communication competence for grading purposes, in our frequent face-to-face meetings to discuss each team's performance, the design clinic professors and I quickly abandoned trying to separate these two categories. Through these meetings we not only educated each other about the key areas of performance we were evaluating each deliverable for, but we found ourselves embracing the concept of integration. This concept, considered essential to disciplinary research, "involves mutual learning across disciplinary boundaries and the willingness to engage not only with new knowledge, but with new ways of constructing and valuing knowledge" (Paretti et al. 77).

One example of this integrated approach occurred in our meeting after the final design presentations of the semester. By this point each of the 17 design teams had presented three times over the course of the semester, and we were discussing the trends we saw embodied by many of the presentations. These trends included the teams' failure in the presentations to include specific and detailed information to justify their design choices, as well as a misuse of the allotted presentation time (many

of the teams rushed their presentations and had extra minutes that could have been spent providing those desired design details). Rather than treat the poor pacing as a communication issue and the lack of design details as a technical issue, we identified the relationship between the two deficiencies and were able to call students’ attention to this relationship during the design clinic wrap-up session at the end of the semester. In doing so, we were showing students the role communication plays throughout the design process, reinforcing that the communication skills the students had been learning throughout the semester were not isolated but instead very connected to their current and future design projects.

Dialogic Environment

Focus on communication *within* the design process also encouraged a dialogic environment for the design clinic courses. As students navigated through the essential steps of the design process, the design clinic faculty stressed the role communication played within each of these steps and reminded students to consider strategies they had used in the past that incorporated using communication to define and solve problems. (My summer meetings with the faculty prompted this activity). For instance, when working on an early step in the design process, creating multiple design concepts, teams were cued to consider the brainstorming techniques they had been exposed to in prior writing classes, such as mind mapping, clustering, linking, and outlining. They informally presented their initial ideas in the class to demonstrate progression and solicit feedback, and through this practice they were using communication as a tool to negotiate meaning, a necessary element of a dialogic environment.

The design clinic faculty and I extended the dialogic environment beyond the confines of the physical classroom by meeting outside of class with teams we perceived as struggling. After each of the three written report/presentation cycles, there were at least one or two teams who we identified as failing to follow proper design process steps and whose deliverables suffered as a result. Through meetings with these individual teams, we were able to hear teams’ specific constraints which were preventing them from following the recommended design clinic sequence and then engage in an open dialogue that allowed for an exchange of ideas for ways for the teams to “get back on track”. Included in these dialogues were opportunities for not only me to offer verbal feedback regarding how they communicated these ideas in future reports or presentations, but for the design clinic faculty to provide input regarding future reports and presentations as well. These sessions were very enlightening for us as faculty because we got a better sense, after meeting individually with a team, of their questions, perceptions, and misconceptions regarding report and presentation requirements.

Assignments that Foster “Building”

The fact that each design team was required to complete three report and presentation cycles each semester meant that the very nature of these report and presentation assignments encouraged students to build upon their learning experiences throughout the course. Frequent reinforcement of writing a variety of related documents promoted the well-known knowledge transfer strategy of hugging, argued by Perkins and Salomon as key in promoting low-road transfer—application of knowledge to situations similar to the context in which they are learned (28). My involvement in helping MENG faculty communicate these deliverables to students as well as my role in evaluating them helped to emphasize to students that while the purpose driving each report and presentation was unique, there certainly was a common core of information that needed to be included in each one.

For instance, the second report, the midterm status report, required the teams to build upon the content included in their initial proposal and begin filling in many of the details the “Plan” section of the

proposal included. The final report required the teams to build upon the midterm report by including a "Results" section that provided information for each of the steps included in the "Plan" section. The same was true for each of the oral presentations. Through the design clinic templates, described within the "Faculty and Student Collaboration through Template Creation" section, we were able to provide outlines of essential information to include in these deliverables. The exercise of returning to the same core of information for each of the three reports and presentations encouraged the students to reflect upon the feedback and evaluation the MENG design faculty and I had included on the previous report and address problematic issues in the current report or presentation they were working on.

A MENG-Design Clinic Technical Writing Course

In addition to my collaborative activities with the junior and senior design professors, I also developed and taught a section of technical writing limited to juniors and seniors enrolled in the design clinic. (MENG students are encouraged to fulfill the general education requirement of the technical writing course in their junior year). Design of this course was shaped by the same three conditions presented by Artemeva et al. The syllabus (see Appendix 9 [#appendix9]) evolved through summer meetings with design clinic faculty to determine the best ways to achieve connected assignments, a dialogic environment, and include assignments that fostered building. Since this past semester was the first time this course was offered, enrollment was only 11 students (the other students in the design clinic had either already taken the technical writing course or could not fit it in their schedule). In the future we expect that we will become closer to filling the course with 20 students.

Connected Assignments

Teaching this course specifically for students enrolled in the design clinic enabled me to connect key assignments directly to design clinic deliverables, with an emphasis on the same genres, terms, and evaluation rubrics taught and used in the design clinic. Although the technical writing course was a separate course from the design clinic, the course objectives and syllabus were so closely tailored to the design clinic course that "Rather than viewing their course work as dummy runs or simulations" the students perceived what they were doing "as being real and having consequences" (Artemeva et al. 303) .

Similar to Artemeva et al.'s course design that was based on the pedagogical theories of genre advanced by Russell, our course design was driven by the same goal to "allow students to experience recurring rhetorical situations within the context of their engineering course, thus providing them with an opportunity to acquire rhetorical skills necessary to accomplish engineering-related tasks" (305). By situating the communication course assignments within the context of the engineering design courses, we facilitated student integration into the discourse community.

Dialogic Environment

In my class, the students were required to apply a process approach towards communication that resulted in early and ample planning and revision of texts they were required to produce for the design clinic. As a result, the technical writing course helped reinforce the importance of communication *as part of* engineering process. Rather than provide instructions on how to write common engineering genres, my focus was more concerned with facilitating the kind of mediated social interaction considered "central to situated learning" (Paretti 493). For instance, through peer review activities for both written assignments and oral presentations, students had the chance not only to share drafts of their texts, but also to discuss the reasons why they were making decisions in these texts regarding

content, organization, format, and style. In turn, the class climate was a dialogic one where, in addition to my feedback to students, there was room for them to provide constructive criticism to one another.

Assignments that Foster "Building"

Just as the three rounds of report and presentation deliverables students were required to complete for the MENG design clinic lent themselves very well to fostering building and promoting the hugging strategy advocated by Perkins and Salomon, focusing on these same assignments and additional ones in my class provided students the opportunity to build on learning experiences in the course. For example, the technical definition/description assignment, one that was not required for the MENG design clinic, prompted students to consider how best to write a technical definition or description related to their team's project but geared towards a non-engineering audience. The students employed the same strategies of clear and concise writing, logical organization and arrangement, visual depiction of processes or concepts within the text, and effective formatting that they had used for writing design clinic deliverables, but with a new audience to focus on, they had to determine how best to accommodate the information to readers with a different knowledge base. Thus, they were building upon their knowledge of how to properly shape content for a particular audience.

Graduate-Level Communication Course

The success of the pilot graduate-level communication course I taught in Fall of 2010 influenced the MENG department's decision to make this course part of the catalog and offer it once annually (for course syllabus, see Appendix 10 [#appendix10]). While it is not required for M.S. students, MENG faculty heavily encourage their students to take it. With a cap of 12 students, the course is designed so that it is large enough to provide a community of peer reviewers and facilitate collaboration among students, yet small enough so that I can spend appropriate time working with students individually.

In designing the course, I sought input from MENG faculty as well as graduate students to better understand what students' perceived communication needs and weaknesses were. While I did not specifically discuss knowledge transfer literature with the MENG faculty and graduate students I consulted, I *did* very quickly come to understand the value they placed on course content that could be connected to the writing and speaking tasks the students were already likely to be engaged in. The syllabus addresses these common deficiencies in writing and speaking with a focus on the genres most commonly used in MENG research activities.

Although it makes facilitating the course more complex for me, the assignments are catered towards individual students' own deliverables and deadlines so that the course instruction is supporting students' work on texts essential to their research such as proposals, articles, conference presentations, and thesis chapters. With much time dedicated to drafting and revision, I emphasize the value of communication within each phase of engineering research and design, a strategy supported by previous research (Ford; Wojahn et al.; Dyke and Wojahn; Winsor) that has attested to the value of instilling in students the importance of recognizing the integration of writing within technical efforts as a problem-solving device, not just as a recording of efforts after-the-fact or what Hanson and Williams describe as "a skill tacked onto the technical work at hand" (515). For instance, I require students who are early in the thesis writing stage to develop an in-depth thesis outline that they first get feedback on in class and then share with their thesis committee members. This document helps reinforce the importance of communicating research in early stages (the students reported that even talking through the rough draft of this outline in class was a beneficial exercise) and provides a vehicle for the students to be able to obtain MENG faculty feedback on the intended content and organization for their thesis early on.

Further, the graduate course serves as an excellent site for transfer to occur because the majority of the students in the graduate program completed their undergraduate MENG degree at our institution. That means that I can refer to rhetorical concepts they were taught in the undergraduate writing courses as well as build on their experience writing various reports and planning presentations for the design clinic.

Although the texts students are working on already have actual audiences beyond the classroom, I reinforce the notion of analyzing one’s audience and planning, organizing, and delivering content appropriately by requiring students to present their research at the department’s Graduate Faculty Seminar. That course, required of all graduate students, features weekly speakers and is well attended by not just faculty, but all levels of students in the department.

Faculty and Student Collaboration through Template Creation

To further student and faculty development of a meta-awareness of rhetorical strategies, our program includes opportunities for students to volunteer to collaborate with faculty to create templates and communication guides to serve as models and reference points for future students. To date we have completed a thesis template used by M.S. students, templates for all of the deliverables required in the design clinic courses, and a design process best practices guide (due to the extensive length of these templates, they have not been included in the appendices). With this activity of involving current students in the process of creating templates and communication guides for future MENG students, we are providing the chance for students and faculty to engage in metacognition and collaboration through a dialogic environment that enables participants to understand similarities between previous writing and current writing tasks, a strategy advocated in the literature (Hanson and Williams; Artemeva; Ford; Artemeva et al.; Kruger and May; O’Donnell et al.). Already I have witnessed the students “develop a language to talk about communication,” which Paretti argues will make them more effective at transferring writing skills across contexts (“Interdisciplinarity”).

Recent work on the thesis template serves as an excellent illustration of the benefits reaped from this activity. During the process of creating the template, several faculty members shared examples of past theses that they considered well written, and excerpts from these theses were incorporated into a template that modeled effective ways to communicate and organize MENG research while complying with our institution’s own thesis formatting guidelines. Current graduate students were given an early copy of the template and asked to provide feedback to indicate what parts of the template were helpful to them as they were in the writing process and what parts could benefit from revision/further information. Their particular questions and comments were addressed in a revised version of the template, which was again shared with faculty.

That second thesis template prompted a discussion from faculty regarding individual preferences for organizing information. Some faculty advocated for a self-contained thesis chapter approach that incorporated results within individual chapters detailing experiments, while others argued for a more traditional approach that grouped results together into a single thesis chapter. It was interesting that the initial version of the template did not provoke such discussion; faculty contributing to and viewing the first thesis template seemed to focus more on stylistic and formatting issues. Through the opportunity for further discussion presented by the revised template, MENG faculty gave more thought to what we in writing studies consider “higher order” rhetorical concerns, and they were gaining fluency in the language used to talk about communication, discussed by Paretti (“Interdisciplinarity”).

In trying to reconcile opposing views on the most effective way to organize a thesis, I seized the opportunity to convince my MENG colleagues that rather than use the template as a way to model one

definitive way of organizing chapters, we could instead include notes in the template that communicated to students the various possibilities for arranging and presenting results. Within these notes we remind students that they should analyze the needs of their audience and consult with their advisory committee regarding their expectations for thesis organization. The template, then, serves not only as a style and formatting guide, but as a vehicle for provoking student-faculty conversations regarding communicating their research effectively.

Involvement in Curriculum Design and Revision

Through my joint appointment, I am presented with several opportunities for helping shape MENG curriculum, and through those opportunities, I am participating in the kind of "complex knowledge synthesis" that stems from interdisciplinarity (Paretti et al. 76). As one example, my participation in faculty meetings enables me to discuss with MENG colleagues the possibilities for curricular change facilitated through recent external grants designed to improve many facets of our university ranging from classroom technology to student retention. Our university currently is in year 3 of a 5-year Title V Promoting Postbaccalaureate Opportunities for Hispanic Americans (PPOHA) grant awarded from the Department of Education. A main goal of this grant is to improve graduate students' communication skills. As a result, this grant provides support and opportunities for faculty interested in developing new graduate courses including a substantial communication component. Several faculty members in our department have sought my help in proposing new courses to meet this need. These courses will provide multiple opportunities for me to become involved with continuing to shape curriculum that includes research-based writing pedagogy driven by approaches that attempt to facilitate students' transfer of prior knowledge of rhetorical strategies.

Programmatic Constraints

The constraints involved in the current model of the program fortunately do not include the institutional barriers so commonly noted by faculty working in WAC and WID programs. Since I am considered a tenured member of the MENG department who participates in departmental decisions, discussions, and activities, and who has full access to departmental resources, my role is not inhibited by the lack of funding, recognition, or understanding experienced by WPAs reported in Paretti et al.'s (2009) survey. Fortunately for me, the administrative logistics and divisions between departments that may prevent multidisciplinary models from easily succeeding do not come into play.

Nevertheless, our program and the goals underlying it are ambitious and not without constraints. The most significant of these constraints pertains to workload. Since the undergraduate program has experienced rapid growth in a fairly short timeframe (enrollment has increased by approximately a third over four years), there is a fear that continued growth would make courses such as the design clinic too large for our current model of communication integration to be viable. At our present enrollment of 93 students in the junior/senior design clinic, we face challenges of securing classroom space large enough to accommodate joint sessions. More concerning is the amount of grading that would be present with an even larger enrollment. With our current number of 17 teams, evaluation of the deliverables is time consuming and daunting, but doable. Adding more proposals, reports, and presentations to our grading load would prevent my colleagues and me from being able to provide the level of in-depth comments and constructive criticism we currently offer.

The other main constraint is that the nature of my joint appointment means that I must devote the other 50% of my time towards teaching and service activities in the Technical Communication program. While my research agenda spans both disciplines and does not have the need for demarcation, I am responsible for developing and teaching courses for Technical Communication students and for leading and participating in departmental committees, advising, etc. Thus, out of

necessity, I find myself having to refrain from adding additional goals to enhance the role of communication in the MENG department, and there are certain projects I simply cannot engage in at this time. (One example is a recent initiative on our campus to create living/learning communities as a way to improve freshman retention. The idea of proposing a community that fostered collaboration between MENG and Technical Communication was enticing, but I simply cannot pursue it at this time.)

Lessons Learned So Far

Although it has only been one semester since my joint appointment and our resulting program to better integrate communication and knowledge transfer of rhetorical strategies in the MENG curriculum began, already I can offer some preliminary lessons learned. While these lessons may seem unique to one particular situation, I share them here with the belief that highlighting them can provide further insight towards the benefits of interdisciplinary models of writing instruction, particularly for audiences interested in adopting models with similar goals.

- The emphasis on writing as part of engineering processes in both the undergraduate design courses and the graduate communication course is effective. MENG faculty report a noticeable difference in student approaches towards the drafting process, with final versions of undergraduate and graduate student work reflecting more polished efforts and demonstrating evidence of revision more so than in the past. While I am currently collecting data to be able to make a comparison of evaluation of student performance on communication deliverables from previous years and this year, with only one semester under our belt it is too early to share and draw conclusions from this data.
- A joint appointment is advisable only for individuals who already have earned tenure. Even though on paper the division of a joint appointment is an equal 50/50 between two departments, inevitably the workload surpasses those of a more traditional academic position housed in just one department. For example, while aspects such as course load and number of advisees can be split evenly, to remain a dedicated colleague in each department requires attending meetings in both departments and participating fully in service activities in both departments. While I ultimately see the joint appointment as yielding unique research opportunities in ways that a traditional arrangement couldn’t, as a tenured faculty member I do not have the same pressure to maintain a yearly rate of scholarly productivity as a junior faculty member. Thus, especially in this first year as I work on the development of many initiatives to accomplish the goals of our program, my research activity has lessened.
- In just one semester I have learned my participation as a colleague in the MENG department transcends that of playing the role of the language expert. While collaborating with faculty through departmental meetings and committee work, exchanging information with members of the MENG program’s advisory board during meetings and electronically, and interacting with MENG students within my courses and outside them through advising and attendance of SAE chapter events, I have come to realize that my “understanding of disciplinary and workplace norms that are central to situated cognition” is becoming richer and exceeding the level of understanding most language faculty possess (Paretti 2011).

Broader Implications for Technical/Professional Writing Programs

While this article profiled one specific program and provided in-depth information about my experiences as a faculty member belonging to two departments, I realize that a joint appointment may not be a viable option for most. However, from this experience I can offer the following implications for technical and professional writing programs and faculty interested in facilitating transfer through interdisciplinary initiatives.

- Faculty outside of writing disciplines typically do view writing as a valuable part of students’ thinking and problem solving processes, even if initially they may not have the tools to articulate it well. Through conversations with faculty from other disciplines about the role writing plays within the processes integral to their discipline, whether they occur in formal settings such as designated meetings or informally through “hallway encounters,” writing faculty have an excellent opportunity to begin dialogues regarding faculty’s communication goals and expectations for their students. Becoming more aware of these expectations can open discussions and drive further steps involving reinforcing communication instruction within and outside the classroom. Asking to see both effective and ineffective examples of various kinds of writing in a particular discipline is an excellent way to converse with other faculty about their expectations for effective writing and better understand what those faculty mean when they use terms like style and format (faculty outside of writing studies often assign different meanings to these terms than we do).
- Working with faculty from another discipline can help writing faculty evolve their own ideas about communication practices and “let go” of arbitrary-seeming “rules” and instead adopt a more flexible approach towards educating students about effective practices of communication. As a case in point, for over a decade I have taught students that when planning effective presentations they should not have more slides than they do minutes to present, as the typical time spent by presenters on slides is one minute. However, now that I have been an audience member for numerous design team presentations, I have witnessed examples of presentations that abide by this rule and as a result lack crucial details that communicate justification of decisions. Within disciplines where visual results are essential to an audience’s understanding and acceptance of an idea, the better presentation advice for students is to allocate time appropriately throughout the presentation and recognize that visuals will take more time to explain but can enhance presentations in ways that a simple bulleted list on a slide cannot. Rather than limiting students to a particular number of slides, my new approach is to teach them to prioritize the slides in terms of the potential of each one to provide essential information to the audience and then allocate the most time to slides in order of priority.
- Students, both undergraduate and graduate, appreciate templates and rely on them heavily. As faculty, we recognize that along with the benefits that accompany having models on hand are the potential downsides of these templates interfering with students’ ability to critically analyze rhetorical situations and make their own decisions regarding content, organization, style, and format. Further, previous knowledge transfer literature has not treated templates as a device that can help students develop higher-order rhetorical strategies such as audience awareness. However, I argue that involving students in the process of creating and revising templates so that they include annotations reminding students *why* certain organizational schemes and formatting devices are recommended can cue students’ metacognition of higher order rhetorical strategies. This activity can serve as an excellent way to promote the bridging of students’ knowledge of rhetorical strategies to discipline-specific genres, an act that can promote high road transfer.
- It is possible to provide constructive feedback to students’ discipline-specific writing without advanced knowledge of the field they are writing about. Even at the graduate level when students are writing theses, writing faculty can serve as readers focusing on higher-order concerns pertaining to content and organization. In a graduate-level writing course, a writing faculty member’s instruction and feedback can be coupled with peer reviews of drafts which result in feedback pertaining to communication *and* technical (or discipline-specific) content. While one may assume that there is a definitive split between these two levels of feedback, I have found that as the semester progresses after reading enough work from the students, I have enough of a background in their content areas to be able to ask the right questions and offer suggestions that drive revisions to text and images not just at the sentence-level, but at the global level.

- Students (and faculty) tend to be more receptive to communication instruction if they do not view it as coming from "an outsider". The fuller the participation in a course, curriculum, or even department, the more likely the students and faculty are to embrace the ideas as relevant and worth considering and implementing. For example, rather than an occasional guest lecture, repeated visits to a class, including serving as an audience member for written work or an oral presentation, can go a long way towards reshaping this outsider/insider status. The fuller the context we have of another discipline, the more effective our suggestions can be for improving assignments, evaluations of those assignments, and overall communication skills.
- Opportunities may exist that help writing faculty to more easily make in-roads with faculty from other disciplines, and those opportunities should be seized. In this article I provided an example of an external grant focused on graduate-level communication skills that has brought increased attention towards writing instruction at our institution and provoked discussions and changes to the curricula as a result. While that example is unique to our university, I mention it to call attention to the kinds of institutional projects that have the potential to transform faculty's approaches towards communication instruction. Another example, which many institutions already have in place, is a campus-wide student research symposium where students from all disciplines have the opportunity to present their research through presentations and posters. This event can take many shapes (presentations, as well as poster displays, as well as written abstract and report requirements) and can be targeted towards undergraduate students, graduate students, or both. Such an event provides ample room to connect with students and faculty from other disciplines through vehicles such as preparatory writing and presentation workshops and work with faculty from other disciplines to devise guidelines, rubrics, and evaluate student work.

In closing, I must confess that when I was drafting this list of broader implications, I couldn't help but add a final bullet stating "And all of this stuff is a heck of a lot of work." While that bullet didn't make the final cut, I do feel compelled to acknowledge here that yes, the initiatives I've described in this program profile as well as the implications for readers do require much work. Since my program is in the early stages, I can't offer here conclusive evidence to prove that the efforts are worth it. What I *can* do is reflect back on the previous studies of knowledge transfer within writing studies, particularly those termed by Brent as "glass half-full studies," and remind myself that although knowledge transfer is often assigned adjectives like elusive, complex, and even messy, the literature "assures us that it happens, and indeed happens often, given the right conditions" (409). As the program I've profiled here evolves, I look forward to sharing definitive results. I look forward as well, to future studies from writing faculty from other institutions as they work towards facilitating transfer via the interdisciplinary initiatives I've described here in ways that are appropriate on their campuses. It is only through further study of this rich problem (my adjective here is inspired by the glass half-full discussion) that we will yield results to remind us that our work in knowledge transfer of rhetorical strategies does carry with it rewards that make the effort worth it. These rewards not only benefit us as researchers and educators, but more importantly, they benefit our students.

Appendices

Because of their length, most appendices are available on a separate web page [new-mexico-tech-appendices.php] (see links below). Appendix 1 is delivered as a separate PDF.

1. Appendix 1: Sequence Chart for NMT Mechanical Engineering [new-mexico-tech-appendix1.pdf] (PDF)
2. Appendix 2: MENG Senior Design Clinic Syllabus [new-mexico-tech-appendices.php#appendix2]

3. Appendix 3: MENG Design Clinic Proposal Guidelines [new-mexico-tech-appendices.php#appendix3]
4. Appendix 4: Design Clinic Proposal Communication Grading Rubric [new-mexico-tech-appendices.php#appendix4]
5. Appendix 5: Weekly Status Report Template [new-mexico-tech-appendices.php#appendix5]
6. Appendix 6: MENG Design Clinic Weekly Status Report Rubric [new-mexico-tech-appendices.php#appendix6]
7. Appendix 7: Junior/Senior Design Midterm Project Presentation Evaluation [new-mexico-tech-appendices.php#appendix7]
8. Appendix 8: Junior/Senior Design Final Project Poster Presentation Evaluation [new-mexico-tech-appendices.php#appendix8]
9. Appendix 9: Undergraduate Technical Writing Syllabus [new-mexico-tech-appendices.php#appendix9]
10. Appendix 10: Graduate MENG Communication Syllabus [new-mexico-tech-appendices.php#appendix10]

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